

DRAFT SUPPLEMENTAL REPORT
to the Section 205
**FINAL DETAILED PROJECT REPORT AND
ENVIRONMENTAL ASSESSMENT ON**
MAGPIE CREEK, CALIFORNIA



January 2004

**U.S Army Corps of Engineers
Sacramento District
South Pacific Division**

Cover picture: The photo depicts a vehicle on Raley Boulevard just south of Magpie Creek during the 3 February 1998 Flood. Depth of flooding was estimated at 2-1/2 feet on the road.

EXECUTIVE SUMMARY

Background

The Magpie Creek watershed (see Figure 1, Map of the Magpie Creek Area) is located in Sacramento County in the northern part of the City of Sacramento. Draining an area of about 15 square miles, the watershed - a sub basin of Dry Creek and a minor sub basin of the American River basin - is bounded by Interstate 80, Steelhead Creek (formerly the Natomas East Main Drainage Canal), and Dry Creek. Its area is characterized as partially urbanized by a mix of rural lands and residential and industrial uses. Typically of the California Central Valley, the area is level with elevations ranging from 40 to 50 feet above mean sea level.

Historically, Magpie Creek flowed southwest from Raley Boulevard to a location near the intersection of Interstate 80 and Steelhead Creek. In the early 1950's, the Corps of Engineers constructed the Magpie Creek Diversion Channel (MCDC) that diverted the flow of Magpie Creek and conveys it to Robla Creek and eventually to Steelhead Creek.

Increased urbanization over the past 50 years has resulted in frequent flooding in the Magpie Creek area. As recent as February 1998, floodwaters bypassed or outflanked the diversion levee at Raley Boulevard causing flooding to roads and residential and commercial structures. Generally, flood damages in the study area occur in one or more of the following ways: the combined flows of Magpie and Don Julio Creeks overtop their banks, floodwaters overtop Raley Boulevard, and floodwaters exceed the MCDC channel capacity. An estimate of total damageable structures in the study area is \$51.8 million.

In the 1990's the Corps of Engineers investigated flooding in the Magpie Creek area and prepared the Final Detailed Project Report (DPR) and Final Environmental Impact Statement/Environment Impact Report (EIS/EIR), Magpie Creek, California, in April 1996. It recommended a channel plan that was depended on upstream improvements by the McClellan Air Force Base. However, with its closure, upstream improvements did not materialize. WithIn1996, the Corps redesigned the project as a standalone and prepared the December 1996 Supplemental Report to document the change. With its approval, the recommended plan became the 1996 approved plan. In June 2001, during detailed design, the total project cost increased significantly from \$8.2 million (October 1995 price levels) to about \$15 million. The increase was for the project's channel-widening feature and associated environmental impacts. The cost increased was beyond local affordability. Ultimately, local interests contracted David Ford Consulting Engineers to make a hydraulic analysis of a

locally proposed alternative to be known as the locally revised plan. Consistent with the Corps's reduction in flood risk, the plan was also developed to cause less environmental impacts and be less costly. In summer 2002 and in cooperation with the local sponsor, the Corps reinitiated studies to reformulate the project and to consider the locally revised plan.

Authorization

This study was conducted under Section 205 of the Flood Control Act of 1948 (PL80-858), as amended, for flood control.

Through plan reformulation, the plan selected was different than the approved 1996 plan. By Corps guidance, when a different plan is proposed, documentation on changes from the approved to the currently proposed plans must be presented. These changes are explained in Chapter 1 and summarized in Table ES-1 below.

Table ES-1. Summary of Changes Between the 1996 Approved and Currently Proposed Plans

Project Outputs	1996 Approved Project	Currently Proposed Plan	Change in Percent
Reduction in flood risk as measured by true exceedence probability of overtopping	0.0058 or a flood occurring once in 170 years.	0.004 or a flood occurring once in 250 years.	+47
Channel Modification		Deleted	-100
Trapezoidal Earth-lined			
Length	7,890 feet	N/A	
Bottom Width	50 feet	N/A	
Slope	IV on 2H	N/A	
Levees – West and South Sides of MCDC		Deleted	-100
Crown width	12 feet	N/A	
Side Slopes	1V on 2H	N/A	
Average height	5 feet	N/A	
Length	3,100 feet	N/A	
Raising Levees – West and South Sides of MCDC	N/A	Added	+100
Crown Width	N/A	12 feet	
Side Slopes	N/A	2H:1V on landside 3H:1V on waterside	
Average Height	N/A	Raise up to 5 feet	
Length	N/A	2,100 feet	

Levees – East and North Sides of MDCDC		Deleted	-100
Crown Width	12 feet	N/A	
Side Slope	1V on 2H	N/A	
Average Height	5 feet	N/A	
Length	3,150 feet	N/A	
New Levee – West Side of Raley Blvd.	N/A	Added	+100
Crown Width	N/A	12 feet	
Side Slopes	N/A	2H:1V on landside 3H:1V on waterside	
Average Height	N/A	4 feet	
Length	N/A	1,000 feet	
Flood Plain Preservation	N/A	Added 76.5 acres	+100
Relocations	N/A	1 slide gate, 2 pipe gates and fencing	+100
Maintenance Access Road	N/A	Added 2,100 feet of 12 foot-width maintenance access road from Vinci Ave. to Dry Creek Road (2.5 acres)	+100
Culvert at Robla Creek	N/A	Added	+100
Width	N/A	3-5'X5' culverts for a total opening of 75 square feet	
Height	N/A		
Length	N/A	20 feet	
Tank Disposal	N/A	Added disposal of tank located at north of MDCDC & west of Raley Blvd	+100
Dry Cr Rd Br	Reconst Br	Deleted	-100
Raley Blvd Br at Magpie Ck	Reconst Br	Deleted	-100
Vinci Ave Br	Remove Permanently	Deleted	-100
Environmental Mitigation	Purchase USFWS Mitigation Banking, 47.29 acres	Minimal, indirect impacts to 0.25 acres of wetlands	-99
Environmental Mitigations During Construction	Control dust, muffle equipment noise, avoid transportation	Control dust, muffle equipment noise, avoid	Difference exists but not estimated.

	route in residential & sensitive areas & limit const wk hr.	transportation route in residential & sensitive areas & limit const wk hr.	
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Objectives

The planning objectives in the 1996 DPR and 1996 Supplemental Report were reviewed and updated with the following additions:

- Provide a greater reduction in flood risk for the Magpie Creek area. In this regard, the non-Federal sponsor's planning objective is to seek a project that provides higher flood protection of up to the 250-year storm event and is certifiable by the Federal Emergency Management Administration (FEMA).
- Avoid detrimental environmental impacts and to include any justifiable mitigation for unavoidable impacts. The priority for justifiable mitigation is mitigation banking.
- Give serious consideration to preserve historical, archeological and cultural resources.

Alternative Flood Management Plans

In reevaluating the project, plan reformulation included how previously studied flood prevention measures and alternatives in the 1996 DPR and 1996 Supplemental Report were made, how they compare with the updated planning objectives and how new alternatives are formed. In addition to the no action, two alternatives were evaluated. They are described as follows:

No Action Alternative. This alternative assumes no Federal participation in flood control to Magpie Creek. Any future developments would have to be flood proofed to the 100-year FEMA level. Without any flood control improvements, existing properties along the Magpie Creek corridor would continue to be at risk of flooding. Flooding at bridges over Magpie Creek, particularly Raley Boulevard, would continue to disrupt local transportation operations and planned uses of land within the flood plain would be subject to development restrictions. It also assumes that development in the watershed continues as described in the City of Sacramento General Plan. This means that runoff will increase with time. The expected annual flood damages are expected to reach about \$2.1 million in the study area.

Levee Raising Along Raley Boulevard Alternative. This alternative includes a new levee along the eastern edge of Raley Boulevard starting from Santa Ana Avenue and extending up to Vinci Avenue. A floodwall will be constructed along the western edge of the existing Raley Boulevard Bridge over Magpie Creek to connect the levees north and south of the bridge. The plan is to prevent all outflanking and overtopping and to keep flood flows in the MDCD. The new levee and floodwall along Raley Boulevard will be approximately 2,500 feet long and constructed to an elevation of 49.5 feet. A new culvert for Don Julio Creek will be placed where the levee crosses the existing creek. This alternative includes flooding of approximately 68 acres bounded to the west by Raley Boulevard, to the north by Vinci Avenue, to the east by McClellan Business Park boundary, and to the south by Santa Ana Avenue, of which 48 acres are within the existing flood plain. New maintenance roads between Vinci Avenue and Dry Creek Road, flood control gates, and removal of a tank are also included.

Natural Flood Detention Basin and Levee Alternative. This alternative includes levee raising on the existing levee along the MDCD; new levee along Raley Boulevard; flooding of about 76.5 acres of existing flood plain bounded to the west by Raley Boulevard and the MDCD, to the north by Vinci Avenue, to the east by McClellan Business Park boundary, and to the south by Magpie Creek and Santa Ana Avenue; a culvert and drainage at Robla Creek; new maintenance roads (totaling 2.5 acres) along the MDCD and between Vinci Avenue and Dry Creek Road; flood control gates; and removal of an abandoned tank. This alternative is similar in feature to the locally revised plan.

Selected Plan

Reevaluating the project resulted in identifying the Natural Flood Detention Basin and Levee Alternative at the 0.004 true exceedence probability of overtopping, which can be interpreted as a flood occurring once every 250 years, as the selected plan. This plan was formulated to combine the natural storage in the existing Magpie Creek flood plain with new levees and levee raising along the MDCD to prevent outflanking and overtopping. The selected plan has significantly less environmental impacts and mitigation than the 1996 approved plan. It also is less costly from about \$15 million to \$9.3 million.

While smaller than the national economic development (NED) plan, the locally revised plan is the maximum size plan that the local sponsor would accept and financially support. Analysis showed increasing net benefits beyond that of the selected plan and the physical size would exceed the local affordability. Continued development of larger scale plans in an effort to identify the NED plan was found impractical. In addition, the outputs of the selected plan included small residual flood damages and its net benefits were determined to be greater

than smaller scale plans. Based on these conditions, the Corps's categorical exemption to develop and recommend the NED plan is applicable and, as a result, the NED plan was not developed. On this basis, the selected plan is to be cost shared in the same manner as the NED plan and is to become the Federally supportable plan.

Features of the selected plan are shown in Plate 1. The plan would prevent about \$1,860,000 of expected annual flood damages and the residual flood damages would be about \$200,000.

The total first cost of the selected plan is estimated at \$9,300,000 (October 2002 price levels). The total annual cost of the plan is estimated at \$670,000, which includes \$10,000 for the project's operation, maintenance, repair, replacement, and rehabilitation. The expected annual benefits at 5-7/8 percent interest rate, October 2002 price levels and 50-year period of analysis are estimated at \$1,860,000, resulted in a benefit-to-cost ratio (BCR) of 2.8 to 1.

Cost Sharing

According to the Water Resources Development Act of 1986, as amended, the non-Federal sponsor is required to cost share 35-50 percent of the total project cost. The non-Federal sponsor would provide lands, easements, rights-of-way, relocations, and disposal areas (LERRDs) for construction and maintenance of the project; a cash contribution of 5 percent of the total project cost and any additional cash to bring the non-Federal share to a minimum of 35 percent of the total project cost for the structural features.

Based on these requirements, the total project cost is \$9,300,000 (rounded). Total Federal and non-Federal cost shares are 50-50 at \$4,650,000 each. Non-Federal cost share includes LERRDs of \$7,020,000, cash contribution of \$470,000, and Federal reimbursement of \$2,840,000. At project transfer, the non-Federal sponsor is responsible for the operation, maintenance, repair, replacement, and rehabilitation of the project.

Tables ES-2 through ES-4 below show the first cost of the project, non-Federal and Federal cost share, annual costs and economic summary of the selected plan.

Table ES-2. Federal and Non-Federal Cost Share of the Selected Plan¹

Cost Share	Total
Federal	4,650
Non-Federal	4,650
(LERRD)	(7,020)
(Cash)	(470)
(Reimbursement)	(-2,840)
Total	9,300

¹ October 2002 price levels, in \$1,000's

Table ES-3. Average Annual Costs of the Selected Plan (\$1,000)

Costs	
Total First Costs	9,300
Interest Rate	5-7/8%
Period of Analysis (Years)	50
Interest and Amortization	660
OMRR&R Costs	10
Total Annual Costs	670

Table ES-4. Economic Summary of the Selected Plan (\$1,000)

Item	
Annual Costs	670
Annual Benefits	1,860
Net Benefits	1,190
BCR	2.8 to 1

Local Support

The local sponsor includes the California Reclamation Board and Sacramento Area Flood Control Agency (SAFCA). By letter of intent (in Enclosure E) the local sponsor understands the responsibilities to cost share and to maintain and operate the project at completion.

Conclusions

Through plan formulation, a plan was identified as the selected plan. While smaller than the NED plan, the selected plan at the 0.004 true exceedence probability of overtopping at 0.004, which can be interpreted as a flood occurring once every 250 years, would significantly reduce the current flood risk. By means of the Corps categorical exemption, the selected plan was assumed to be cost shared in the same manner as the NED plan and is to become the Federally supportable plan. The local sponsor has indicated support for and implementation of the selected plan.

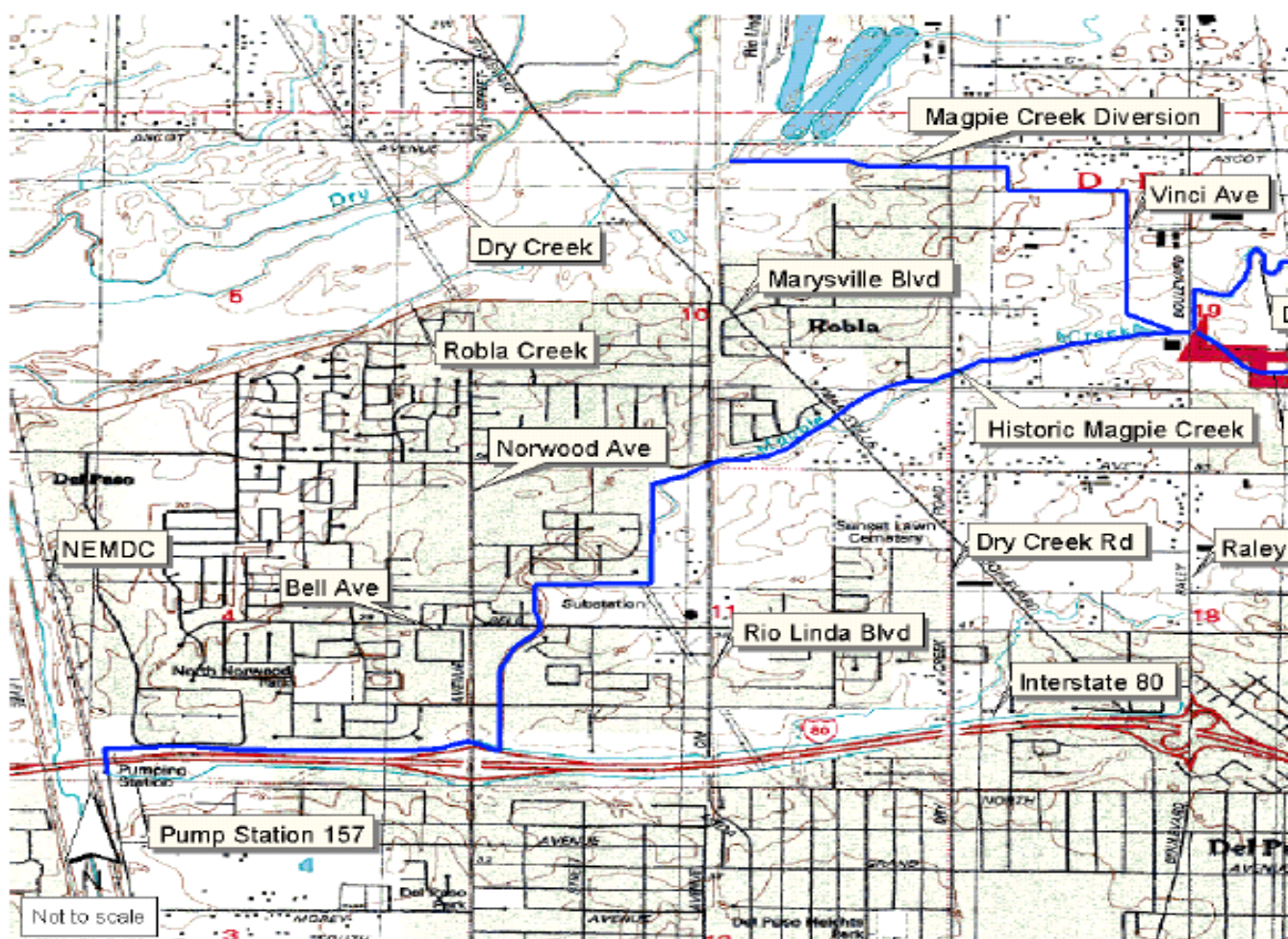


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CHAPTER 1 – INTRODUCTION

PURPOSE/BACKGROUND

This report is a reevaluation of the project in response to local sponsor's request for an environmentally less damaging and less costly plan. Prior Corps studies included the April 1996 Detailed Project Report (DPR) and the December 1996 Supplemental Report. The December 1996 report revised the Tentatively Selected Plan in the DPR as a standalone project from upstream improvements in the McClellan Business Park. In June 2001, during plans and specifications, the revised total project cost significantly increased from \$8.2 million (at October 1995 price levels) to about \$15 million. In April 2002 SAFCA developed a locally proposed alternative, known as the locally revised plan, that eliminated the channel and associated environmental mitigation from the revised Tentatively Selected Plan (in the December 1996 Supplemental Report). The local sponsor contracted David Ford Consulting Engineers to make a hydraulic analysis of the locally revised plan. Developed at the same level of protection at 0.0058 true exceedence probability as the revised Tentatively Selected Plan, the local plan included flood storage in the existing flood plain and levee construction. The local sponsor includes the California Reclamation Board and Sacramento Area Flood Control Agency (SAFCA). In response to the local sponsor, the Corps initiated feasibility-level studies to reevaluate the project and consider the locally revised plan.

AUTHORIZATION

The project is being studied under Section 205 of the Flood Control Act of 1948 (PL80-858), as amended, for flood control.

CHANGES TO THE APPROVED PROJECT

When an approved project is changed to the extent that plan reformulation is warranted, documentation on the changes must be identified and explained. These changes are discussed in the section below in terms of the 1996 plan.

Description of Approved Project

Located within the City of Sacramento boundary, the approved plan is a channel plan that would reduce the flood risk to 0.0058 true exceedence probability, which can be interpreted as a flood occurring every 170 years. The plan consists of conveying peak flows through Magpie Creek by constructing upstream levees to prevent outflanking upstream of Raley Boulevard and improving the existing Magpie Creek Diversion Channel (MCDC). The channel would be an earth-lined trapezoidal section with 15-20 foot bottom width and

2H:1V side slopes. The modified channel is a cut channel, which would contain design flows below the existing grade, although levees would be constructed at the downstream reach between Dry Creek Road and the Robla Creek confluence and between Vinci Avenue and Raley Boulevard. The existing bridges on Dry Creek Road and Raley Boulevard would be rebuilt and the existing bridge at Vinci Avenue removed. About 35 acres of lands would be acquired and one residential structure would be relocated. Initially, about 47 acres of lands were to be acquired to mitigate the project's environmental impacts, but the non-Federal local sponsor intended to purchase bank land credits in lieu of direct mitigation. A project cooperation agreement would have been required prior to real estate acquisition and construction.

Authorization

The project is being studied under Section 205 of the Flood Control Act of 1948 (PL80-858), as amended (33 USC 701S), for flood control.

Funding Since Approval

Total funding since project approval in 1996 (in FY 97) is \$1,496,000 (\$1,254,100 net and \$241,900 of revocations and reprogramming) and is broken down by fiscal year as follows:

FY 98: \$679,000 funded, \$125,000 revoked, \$554,000 net to initiate plans and specification phase.

FY 99: \$135,000 funded, \$10,000 revoked, \$225,000 net to continue plans and specification phase.

FY 00: \$270,000 funded, \$10,000 revoked, \$260,000 net to continue plans and specification phase.

FY 01: \$210,000 funded, \$23,000 revoked, \$187,000 net to continue plans and specification phase.

FY 02: \$93,000 funded, \$73,900 revoked and reprogrammed, \$19,100 net to reevaluate project.

FY 03: \$109,000 funded to date (as of Feb 03) to continue project reevaluation.

Changes in Scope of Approved Plan

The changes to the approved plan are summarized in Table 1 and explained below.

Table 1. Summary of Changes Between the 1996 Approved and Currently Proposed Plans

Project Outputs	1996 Approved Project	Currently Proposed Plan	Change in Percent
Reduction in flood risk as measured by true exceedence probability of overtopping	0.0058 or a flood occurring once in 170 years.	0.004 or a flood occurring once in 250 years.	+47
Channel Modification		Deleted	-100
Trapezoidal Earth-lined			
Length	7,890 feet	N/A	
Bottom Width	50 feet	N/A	
Slope	IV on 2H	N/A	
Levees – West and South Sides of MCDC		Deleted	-100
Crown width	12 feet	N/A	
Side Slopes	1V on 2H	N/A	
Average height	5 feet	N/A	
Length	3,100 feet	N/A	
Raising Levees – West and South Sides of MCDC	N/A	Added	+100
Crown Width	N/A	12 feet	
Side Slopes	N/A	2H:1V on landside 3H:1V on waterside	
Average Height	N/A	Raise up to 5 feet	
Length	N/A	2,100 feet	
Levees – East and North Sides of MCDC		Deleted	-100
Crown Width	12 feet	N/A	
Side Slope	1V on 2H	N/A	
Average Height	5 feet	N/A	
Length	3,150 feet	N/A	
New Levee – West Side of Raley Blvd.	N/A	Added	+100
Crown Width	N/A	12 feet	
Side Slopes	N/A	2H:1V on landside 3H:1V on waterside	
Average Height	N/A	4 feet	

Length	N/A	1,000 feet	
Flood Plain Preservation	N/A	Added 76.5 acres	+100
Relocations	N/A	1 slide gate, 2 pipe gates and fencing	+100
Maintenance Access Road	N/A	Added 2,100 feet of 12 foot-width maintenance access road from Vinci Ave. to Dry Creek Road (2.5 acres)	+100
Culvert at Robla Creek	N/A	Added	+100
Width	N/A	3-5'X5' culverts for a total opening of 75 square feet	
Height	N/A		
Length	N/A	20 feet	
Tank Disposal	N/A	Added disposal of tank located at north of MDCD & west of Raley Blvd	+100
Dry Cr Rd Br	Reconst Br	Deleted	-100
Raley Blvd Br at Magpie Ck	Reconst Br	Deleted	-100
Vinci Ave Br	Remove Permanently	Deleted	-100
Environmental Mitigation	Purchase USFWS Mitigation Banking, 47.29 acres	Minimal, indirect impacts to 0.25 acres of wetlands	-99
Environmental Mitigations During Construction	Control dust, muffle equipment noise, avoid transportation route in residential & sensitive areas & limit const wk hr.	Control dust, muffle equipment noise, avoid transportation route in residential & sensitive areas & limit const wk hr.	Difference exists but not estimated.

Reduction in Flood Risk. The currently proposed plan at 0.004 true exceedence probability is an increase of 47 percent over the approved plan of 0.0058 true exceedence probability.

Channel Modification. This work is deleted shown as –100 percent in the currently proposed plan.

Levees – West and South Sides of MCDL. These levees are reconfigured in the currently proposed plan, as described in the paragraphs below. This change deletes 3,100 feet of levees in the 1996 plan and shown as -100 percent decrease in the currently proposed plan.

Raising Levees – West and South Sides of MCDL. This is a reconfigured design showing an added levee raising at the west and south sides of MCDL at a distance of 2,100 feet, shown as 100 percent increase in the currently proposed plan.

Levees - East and North Sides of MCDL. These levees are deleted from the currently proposed plan as -100 percent decrease. This change deletes 3,150 feet of levees.

New Levee – West Side of Raley Boulevard. A levee of 1,000 feet in length is added in the currently proposed plan, shown as 100 percent increase.

Flood Plain Preservation. The existing flood plains of 76.5 acres on both sides of Raley Boulevard would be acquired and preserved as permanent flood plain lands for the project. This feature of the currently proposed plan is a new change (at +100 percent) to the approved plan.

Relocations. The relocations in the currently proposed plan include replacements of the existing slide gate that provides outlets to historic Magpie Creek and two pipe gates located at Raley Boulevard and Vinci Avenue. A fence along the north side of Kelly-Moore Point would be removed and reinstalled to the new flood control easement line. This is 100 percent addition over the approved plan.

Maintenance Access Road. A maintenance access road of 2,100 feet from Vinci Avenue to Dry Creek Road was added along the west and south sides of MCDL. This feature of the currently proposed plan is a new change (at +100 percent) to the approved plan.

Culverts at Robla Creek. Three 5'X5' culverts providing an opening of 75 square feet are installed through an embankment to Robla Creek. This opening is provided to prevent an increase in peak flood stage on Dry Creek Road as a result of increased peak flows in the MCDL. This feature of the currently proposed plan is a new change (at +100 percent) to the approved plan.

Dry Creek, Raley Boulevard at Magpie Creek, and Vinci Avenue Bridges. These are deleted from the approved plan, shown as -100 percent decrease.

Environmental Mitigation. The currently proposed plan significantly reduces the required mitigation in the approved plan by –99 percent. The original estimate of 47.29 acres was reduced to an indirect impact to 0.25 acres of wetlands. The exact impacts have yet to be decided.

Environmental Mitigations During Construction. While both plans would result in construction impacts, all of which can be mitigated, the differences in impacts were not computed but are considered minor.

Changes in Project Purpose. No change.

Changes in Local Cooperation Requirements. No change.

Changes in Location of Project. No change.

Design Changes. These changes are described in the above Summary of Changes Between the 1996 Approved and Currently Proposed Plans.

Changes in Total Project First Costs. The change in the total project costs between the approved and currently proposed plans of \$8,170,000 (October 1995 price levels) and \$9,300,000 (October 2002 price levels), respectively, is an increase of about 14 percent.

Changes in Project Benefits. The change in the expected annual benefits between the approved and currently proposed plan of \$1,475,000 (October 1994 price levels) and \$1,860,000 (October 2002 price levels), respectively, is an increase of about 26 percent.

Benefit-Cost Ratio. The benefit-to-cost ratio of the currently proposed plan is 2.8 to 1.

Changes in Cost Allocation. Not applicable.

Changes in Cost Apportionment. Not applicable.

Environmental Considerations in Recommended Changes. In the USFWS May 2003 draft Coordination Act Report, no direct environmental impacts were identified. USFWS supports the currently proposed plan. The draft Environmental Assessment /draft Finding of No Significant Impact is scheduled for public review in mid – 2003. Local residents and interested parties will have the opportunity to review and comment on the currently proposed plan. Their comments and responses will become part of the assessment.

History of Project. In the early 1990s, the City of Sacramento requested the Corps of Engineers to study the flood problems along Magpie Creek and develop possible flood control solutions. The study was based on the assumption that military construction in McClellan Air Force Base (AFB) would continue and include improvements on Magpie Creek from Patrol Road to the western boundary of the base. The Final Detailed Project Report and Final Environmental Impact Statement/Environment Impact Report (EIS/EIR), Magpie Creek, California, was completed in April 1996. It recommended a channel plan, known as the Tentatively Selected Plan, downstream of then McClellan AFB. It also assumed that the U.S. Air Force would accomplish flood control improvements upstream of the current project, and flood flows from Magpie Creek and Don Julio Creek would be combined on the AFB and then directed to the current project. With base closure, however, the Tentatively Selected Plan could not function as a standalone system.

In 1996, the project was redesigned by eliminating the AFB portion and by enlarging the channel to facilitate environmental features. This was known as the revised Tentatively Selected Plan. Preparation of plans and specifications on this plan began in October 1997. However, with greater design details, the total project cost increased significantly from \$8.2 million (at October 1995 price levels) to about \$15 million. Ultimately, the local sponsor decided to develop an alternate plan and contracted David Ford Consulting Engineers to make a hydraulic analysis on this plan. This plan, now known as the locally revised plan, is the basis of the Corps's to reevaluate the project.

Design and Construction Considerations. The design effort on the currently proposed plan is reduced because fewer features are involved. Construction is reduced from two to one season in the currently proposed plan.

Operation and Maintenance. Operation and maintenance on the currently proposed plan is reduced because levee length is reduced from 6,250 to 3,100 feet. Maintenance is to be accomplished on top or landside of levees.

Modification Impacts. Given the risk and uncertainty, the change in stage-discharge relationship is minor. Interior flooding that occurs north of Magpie Creek and east and west of Raley Boulevard would still continue.

RELATED WATER RESOURCES PROJECTS

Please refer to the DPR as this is unchanged.

PRIOR STUDIES AND REPORTS

The following studies and reports are in addition to those listed in the DPR:

Federal

Air Force	Environmental Restoration Program, May 19, 1994.
Air Force and Sacramento County	Preliminary Working Draft Environmental Impact Statement/Environmental Impact Report Disposal and Reuse of McClellan Air Force base, California, 1997.
Corps of Engineers and City of Sacramento Public Works	Section 205 Final Detailed Project Report and Final Environmental Impact Statement/Environment Impact Report, Magpie Creek, California. Sacramento District, Sacramento, CA, 1996.
Corps of Engineers	Magpie Creek, California, Supplemental Report to the Section 205 Final Detailed Project Report and Final Environmental Impact Statement/Environment Impact Report, Magpie Creek, CA, December 1996.

State

Department of Fish and Game	Staff Report of Burrowing Owl Mitigation, 1995.
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Local Agencies

David Ford Consulting Engineers	Magpie Creek Flood plain Analysis, Phase III: Flood-Reduction Alternative Analysis, November 2001
EDAW	Initial Study/Proposed Mitigated Negative Declaration for the Magpie Creek Flood Control Project, 2002.
Kleinfelder	Letter report to SAFCA, October 1, 1999.

CHAPTER II - STUDY AREA

SETTING

Please refer to the DPR as this is unchanged.

EXISTING CONDITIONS

This section is updated with the following information:

Hydrology

Since the Corps's 1993 Hydrology Office Report, study results of David Ford Consulting Engineers were used to a large extent to compare and update the hydrologic characteristics. Specifically, they include peak flow data above Raley Boulevard, stage frequency relationships upstream of the bike trail culvert and flowage channel construction, and flow frequency in historic Magpie Creek under the existing and with-project conditions.

Ford revised hydrology compares favorably with the Corps's 1993 report as indicated in Table 2 below. All flows are in cubic feet per second (cfs).

Table 2. Comparison of Ford and Corps Peak Flows above Raley Boulevard

	10-year	50-year	100-year	200-year	500-year
Ford Peak Flow (cfs)	1,610	2,230	2,500	2,740	3,130
Corps Peak Flow (cfs)	1,520	2,320	2,520	2,755	3,025

Vegetation

This section describes the community types, including dominant plant species and associated wildlife species in, and adjacent, to the project area. The vegetation communities include riparian scrub-shrub, coastal and valley freshwater marsh/freshwater emergent marsh, vernal marsh/seasonal wetland, and upland/herbaceous grassland. Other habitats include riparian forest, open or poorly vegetated stream/water bodies, and jurisdictional waters and wetlands. In most cases, these habitats are located within the stream channels or the flood plain property that would be purchased as part of the currently proposed plan.

Riparian. Riparian scrub-shrub is found in or adjacent to the permanent and intermittent stream channels of Magpie Creek, Don Julio Creek, and the MDCD. This community consists of a combination of isolated trees and shrubs, generally with little understory. The dominant plants include willow species such as narrow-leaved willow (*Salix exigua*) and arroyo willow (*Salix lasiolepis*),

Fremont cottonwood (*Populus fremonti*), Oregon ash (*Fraxinus latifolia*), box elder (*Acer negundo*), California black walnut (*Juglans californica*), and patches of Himalayan blackberry (*Rubus discolor*). Riparian forest exists as a small number of large isolated trees in excess of 20 feet in height, including Fremont cottonwood, box elder, and Oregon ash. These trees are scattered throughout the riparian areas and form an open canopy above the riparian scrub-shrub.

Mammal species likely to be found in association with riparian habitat include opossum (*Didelphis virginiana*), Audubon's cottontail (*Sylvilagus auduboni*), and striped skunk (*Mephitis mephitis*). Evidence of beavers was observed just upstream of Raley Boulevard, on both Magpie and Don Julio creeks by the US Fish and Wildlife Service (USFWS) in January 2000. USFWS also observed birds such as ring-necked pheasant (*Phasianus colchicus*), mourning dove (*Zenaida macroura*), California quail (*Callipepla californica*), white-crowned sparrow (*Zonotrichia leucophrys*), western meadowlark (*Sturnella neglecta*), and belted kingfisher (*Ceryle alcyon*) during field surveys in January 2000.

Coastal and Valley Freshwater Marsh/Freshwater Emergent Marsh.

Freshwater emergent marsh is found in the MCD, Don Julio Creek, and portions of Magpie Creek. It is defined by the presence of perennially open water and/or saturated soils and associated obligate wetlands. The dominant plant species in this community are cattail (*Typha* sp.) and bulrush (*Scirpus* sp.). Typical woody riparian species include arroyo willow, Goodding's willow (*Salix gooddingi*), and Fremont cottonwood.

The presence of water year-round provides habitat for a number of resident wildlife species. Mallards (*Anas platyrhynchos*) and red-winged blackbirds (*Agelaius phoeniceus*) nest at the edge of the freshwater emergent marsh. Great egret (*Ardea alba*), green heron (*Butorides virescens*), great blue heron (*Ardea herodias*), black phoebe (*Sayornis nigricans*), pie-billed grebe (*Podilymbus podiceps*), American coot (*Fulica americana*), wood duck (*Aix sponsa*), black-crowned night-heron (*Nycticorax nycticorax*), belted kingfisher (*Ceryle* sp.), marsh wren (*Cistothorus palustris*), and song sparrow (*Melospiza melodia*) were also observed in this habitat by the USFWS in January 2000. Amphibian species such as Pacific treefrog (*Hyla regilla*) and bullfrog (*Rana catesbeiana*), and reptile species such as common garter snake (*Thamnophis sirtalis*) could inhabit the freshwater marsh. Freshwater clams, aquatic insect larvae and crayfish are examples of invertebrates that could inhabit the marsh.

Seasonal Wetland. Seasonal wetlands in the project area include several natural hard pan vernal pools and other areas that may or may not have a hard pan, but form standing water and provide similar biological functions and values as the natural vernal pools. Dominant plant species in these wetlands include spikerush (*Eleocharis* sp.), turkey mullein (*Eremocarpus setigerus*), coyote thistle (*Cirsium* sp.), tarweeds (*Hemizonia* sp.), Mediterranean barley

(*Hordeum marinum*), rush (*Juncus* sp.), and others. The area east of Raley Boulevard, including the seasonal wetlands, is regularly disked for fire protection.

The value of a seasonal wetland for wildlife habitat depends on the size of the wetland, ponding depth and duration, presence of hiding or escape cover, and the presence of a foraging base. Seasonal wetlands support a wide variety of water-associated wildlife when water is present. Avian species that utilize this habitat include herons and ducks, and amphibian and reptile species include Pacific treefrog and common garter snake. In addition, aquatic invertebrates such as fairy shrimp (*Branchinecta* sp.) use the seasonal wetlands.

Upland/Herbaceous. Grassland Herbaceous, upland grassland covers the majority of the project area, including the area adjacent to the MCD, west of Raley Boulevard, sections of the channel banks lacking woody vegetation, and the abandoned rice fields east of Raley Boulevard. Dominant plant species are non-natives such as wild oat (*Avena fatua*), field mustard (*Brassica rapa*), goat grass (*Aegilops* sp.), brome grasses (*Bromus* sp.), and yellow star-thistle (*Centaurea solstitialis*). Native plant species include several brodiaeas (*Brodiaea* sp.), milkweed (*Asclepiadaceae* sp.), tarweed (*hemizonia pungens*), and lotus (*Lotus* sp.).

In the upland/herbaceous grasslands, mammals such as California meadow vole (*Microtus californicus*) and black-tailed jackrabbit (*Lepus californicus*) are abundant. These mammals attract a variety of predators, such as raptors and snakes. Gamebirds such as mallard duck and ring-necked pheasant forage and nest in this habitat. Several California quail were observed during field visits by the USFWS in January 2000. Other birds observed in the project area include western meadowlark (*Sturnella neglecta*), Brewer's blackbird (*Euphagus cyanocephalus*), yellow-billed magpie (*Pica nuttalli*), western kingbird (*Tyrannus verticalis*), and loggerhead shrike (*Lanius ludovicianus*).

Open or Poorly Vegetated Waters. Vegetation cover adjacent to portions of Magpie Creek, Don Julio Creek, and the MCD is limited to grasses or forbs. These portions of the channels provide drinking water for terrestrial wildlife species, but the value of the habitat for birds, mammals, reptiles, and amphibians is limited due to the lack of vegetative cover. Open/poorly vegetated waters primarily support aquatic invertebrates and fish similar to those in the emergent marsh. Fishery resources are extremely limited in the project area due to the nature of the flows in Magpie and Don Julio Creeks, especially in the summer and fall. The only fish known to occur in the project area is the mosquito fish (*Gambusia affinis*). In September 1999, fish surveys were conducted in Magpie and Don Julio Creeks, on the western portion of AFB, upstream of the proposed project area. A variety of common species were documented during the survey, such as largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), mosquito fish (*Gambusia affinis*), carp (*Cyprinus carpio*), goldfish (*Carassius auratus*), and fathead minnow

(Pimephales promelas) were found in Don Julio Creek only. As the creeks flow downstream of the sampling sites towards the project area, the creeks become more shallow and contain fewer species of fish.

Special Status Species

A list of sensitive biological resources, including sensitive habitats and special-status species, that have the potential to occur in the project area was developed. A total of 6 special-status plants and 19 special-status wildlife species were identified as having potential to occur in the project area. However, construction is limited to developed or highly disturbed area so most of these species are not found, or do not have suitable habitat, within the construction footprint. This includes the valley elderberry longhorn beetle; that is, there are no elderberry shrubs in or near the construction area.

Species that have suitable habitat within the construction footprint or could be directly affected by construction activities near suitable habitat include the giant garter snake, Swainson's hawk, northern harrier, white-tailed kite, and burrowing owl. There is potential snake habitat in Magpie Creek, historic Magpie Creek, and the MCDC. Trees in the project area could provide nest sites for the hawk and kite while grasslands and streambanks could provide nesting habitat for harriers and burrowing owls.

Surveys will be conducted prior to initiation of construction for these species, and if the species is present, avoidance measures will be implemented to ensure that there are no significant adverse effects on the species. These measures would include scheduling construction to avoid inactive snake periods and bird nesting seasons. A detailed discussion of species, potential effects, and mitigation measures is included in Enclosure A.

Cultural Resources

The California Archeological Inventory, North Central Information Center, California State University at Sacramento, conducted a record search for the project area and vicinity in 1989. No recorded sites were identified within or near the project area. A record search of the sacred lands file at the California Native American Heritage Commission did not reveal any Native American cultural resources that would be of concern to local Native Americans. The Corps concluded that no historic properties exist within the project area. The State Historic Preservation Officer (SHPO) supported this conclusion.

In April 1993, a Corps archeologist conducted a survey of the project area for the 1996 FEIS/EIR. No historic properties or other cultural resources were found in the project area. The nearest cultural site is more than 1 mile to the north (Corps et al. 1996). An updated record search was conducted at the North Central Information Center in July 2000. No cultural resources were

recorded in the current project area. In addition, the Corps archeologist conducted archival research on both prehistoric and historic cultural resources, including examination of historic maps, ethnographic and historic data. That research did not reveal any new cultural resources that had not been previously identified. In 2000, a reconnaissance survey was undertaken by the Corps archeologist, which resulted in no potential historic or archeological resources. Consultation with the SHPO under Section 106 of the National Historic Preservation Act has been completed. The SHPO has concurred in a letter dated January 16, 2001, that no historic properties would be affected by the project and that Corps obligations under Section 106 are fulfilled.

Hazardous and Toxic Waste Sites

Two preliminary hazardous materials investigations were conducted downstream of McClellan Business Park to assess the potential Hazardous, Toxic, and Radiological Waste (HTRW) sources for the 1996 EIS/EIR (ELM 1993, Kleinfelder 1996). In the 1993 report, ELM identified one site of known contamination, McClellan Business Park, and one "area of concern," the Kelly Moore Paint company. The Kelly Moore Paint Company was on the Sacramento County toxic sites list as having hazardous materials that have been used, handled, or stored onsite. Kleinfelder conducted stream sediment and levee soil sampling in 1996 and found low levels of diesel fuel, oil, and grease consistent with typical urban runoff, and metals in concentrations consistent with normal background levels (ELM 1993, Kleinfelder 1996). McClellan Business Park is in the process of cleaning up and remediating contaminated sites both on- and off-base according to the guidelines in the Installation Restoration Program (IRP) (U.S. Air Force 1994). The IRP was developed to govern cleanup and remediation, document the type and extent of hazardous waste contamination, provide the status of clean-up and remedial activities, establish a process to evaluate past disposal sites, control the migration of contaminants, and avoid potential impacts to human health or the environment. Detailed information about hazardous waste issues on McClellan Business Park can be found in the Disposal and Reuse of McClellan Air Force Base, California Including Rezoning of the Main Base, Final Programmatic Environmental Impact Statement/Environmental Impact Report (U.S. Air Force and Sacramento County 1997).

Kleinfelder collected additional soil samples in August 1998 during the geotechnical investigation of the proposed action (Kleinfelder 1999). Soil samples were collected at depths ranging from 15.5 to 30.5 feet below surface, along the south bank of the west-flowing portion of the MDCD bounded by Ascot and Vinci avenues, Dry Creek Road, and Rio Linda Boulevard. No compounds were detected in the samples analyzed for hydrocarbons, volatile organics, or oil and grease. Metals were detected at normal levels.

In October 1998, Montgomery Watson/CH2M Hill performed hazardous, toxic and radiological waste testing in the MDCD (1998). The soil samples were

tested for cations, volatile and semi-volatile organics, and extractable hydrocarbons, but only cations were detected. The cations found in the highest concentration in the soil samples included barium, chromium, nickel, vanadium, and zinc. However, these cations are naturally occurring and are considered representative of background concentrations. All measured cation concentrations were below the non-hazard levels allowed under Title 22 of the California Code of Regulations.

FUTURE CONDITIONS WITHOUT-PROJECT

Please refer to the DPR as this is unchanged.

CHAPTER III – PLAN FORMULATION

Extensive plan formulation was conducted in the 1996 DPR that resulted in a number of flood prevention alternatives. One of them was developed and selected and is known as the Tentatively Selected Plan. All of these alternatives were evaluated to meet the needs and desires of the public as expressed in specific planning objectives and constraints at that time. Then and now, the Corps's planning process was used in reevaluating the project to either support a previously considered plan or select a new plan that best satisfies new planning objectives.

In this plan formulation, previously considered flood prevention measures and alternatives in the 1996 DPR and 1996 Supplemental Report were reviewed and compared with new planning objectives. New alternatives were also formed to meet the new needs. Revaluation of the project followed the Corps's planning process below.

- Update planning objectives and constraints from the DPR.
- Identify management measures to address new planning objectives and constraints.
- Develop alternatives from the measures to meet new planning objectives and constraints.
- Identify the alternative that maximizes national economic development (NED) benefits.
- Compare and evaluate alternatives.
- Select a plan for recommended implementation.

PROBLEMS AND OPPORTUNITIES

Please refer to the DPR description under this subject heading as it is unchanged.

PLANNING OBJECTIVES AND CONSTRAINTS

On the basis of the identified flood problems and opportunities and local input, the following new planning objectives were added to those listed in the 1996 DPR. All planning constraints remain unchanged.

Technical Criteria

- Provide a greater reduction in flood risk for the Magpie Creek area. In this regard, the non-Federal sponsor's planning objective is to seek high flood protection of up to the 0.004 true exceedence probability event, which can be interpreted as a flood occurring every 250 years and project certification by the Federal Emergency Management Administration (FEMA).

Environmental Criteria

- Detrimental environmental impacts are to be avoided and any justifiable mitigation for unavoidable impacts included. The priority for justifiable mitigation is mitigation banking.
- Consideration is given to evaluating and preserving historical, archeological and cultural resources.

FLOOD PREVENTION MEASURES RECONSIDERED

Prior plan formulation study included a variety of nonstructural and structural measures to reduce the flood risk in the Magpie Creek area. In view of the locally revised plan, this study reexamined these measures on the basis of changed conditions and criteria. These measures are as follows:

Nonstructural Measures

- Flood proofing
- Flood Plain Evacuation
- Development Restrictions
- Flood Warning

The above measures were evaluated as follows:

Flood Proofing

Description. Flood proofing prevents or reduces flood damages to structure and/or contents of buildings located in flood hazard areas generally by altering or changing existing properties or incorporated it into design and construction of new buildings. Three general approaches to flood proofing include raising or moving the structure, constructing barriers to stop floodwater from entering the building or wet flood proofing.

Planning Objectives Met. This measure appeared to meet all environmental criteria considering that most existing structures are located above

and away from environmentally sensitive areas. Environmental impacts, if any, would be minimal under this measure.

Status. Because of a large number of structures in the flood plain, this measure would likely be costly and uneconomical. The objective to increase flood protection would be difficult to meet. This measure was deleted.

Flood Plain Evacuation

Description. Flood plain evacuation involves either moving the structure and contents to flood-free site or removing only the contents and demolishing the structure or using it for some other purposes.

Planning Objectives Met. This measure meets the environmental criteria.

Status. This measure would not likely be socially feasible considering the number of people affected. It also failed to meet the criteria for increased flood protection. This measure was deleted.

Development Restrictions

Description. Development restrictions include zoning, subdivision regulations, and modifications of building and housing codes to require that all future development is compatible with the flood threat. This measure would apply to the upper reaches of Magpie Creek and Don Julio. These areas have development potentials.

Planning Objectives Met. In combination with other measures, this measure has potentials to meet all planning objectives.

Status. Damage assessment indicated that most flood damages occur downstream of Raley Boulevard along historic Magpie Creek in highly urbanized areas of the Magpie Creek watershed. This measure would apply only to the upper reach of Magpie Creek where development is sparse and the flood threat minimal. Because of its limited application and low economic potential, this measure was deleted.

Flood Warning

Description. Flood warning consists of flood forecasting; warning the population; evacuation before, during, and after a flood; and post flood reoccupation and recovery. Those procedures are currently in force by Federal, State, and community governments.

Planning Objectives Met. The measure met all environmental criteria.

Status. This alternative has potentials with other measures in developing flood prevention alternatives. However, because it is currently in force involving other Federal, State and local agencies, this measure was not pursued.

Structural Measures/Plans

The DPR identified the following as basic structural flood prevention alternatives plans:

- Channel and Levee Alternative Plan
- Detention Basin Alternative Plan

The above alternative plans were evaluated with the new planning objectives. The descriptions below provide the rationale in dropping, modifying or retaining them. Modifications were made and retained for further study.

Channel and Levee Plan

Description. This is the recommended plan in the 1996 Supplemental Report revised from the DPR plan. The plan included enlargement of the MCDC to 50-foot base width trapezoidal channel with 2H on 1V side slope for approximately 7,970 feet, installation of 530 feet of riprap and grouted riprap from the channel invert to natural stream, construction of a 25-foot base width trapezoidal channel for approximately 1,700 feet, replacement of the Dry Creek Road and Raley Boulevard Bridges, and construction of embankment levees for 8,919 feet on both banks and an additionally 1,200 feet of levee on the left bank downstream from the McClellan Business Park boundary.

Planning Objectives Met. This plan did not meet the objective for minimal environmental impacts. According to the DPR, preliminary impact assessment indicated a total of 4.6 acres of habitat losses (1.5 acres of seasonal wetlands, 1.8 acres of emergent marsh, and 1.3 acres of riparian scrub-shrub habitat) would have to be mitigated for a total compensation of 17.4 acres. Based on the potential for high environmental impacts and added operation and maintenance costs, the channel plan was deleted. This alternative was modified to levees only. This was retained for further study.

Status. This plan was modified to include levees only. It was retained as a separate measure.

Detention Basin Plan

Description. In the DPR, detention basins were considered at 3 locations: in McClellan AFB, between the AFB boundary and Raley Boulevard, and

between Raley Boulevard and Vinci Avenue. However, the site at the McClellan AFB was dropped after the base was closed. It was noted in the DPR that locating detention sites was largely a matter of avoiding sensitive biological areas. Other concerns were existing utilities, sewer line and electrical towers. Three sizes of 147, 186, and 239 acre-feet detention basins were developed at a site between Raley Boulevard and the AFB boundary. From David Ford Consulting Engineers, an additional basin site of 224 acre-feet was included in the evaluation. This site was located in an area bounded by Vinci Avenue to the north, Raley Boulevard to the east, and the MCDC to the west and south.

David Ford Consulting Engineers and SAFCA developed an additional plan that involves detaining floodwaters in the existing Magpie Creek flood plain (See Figure 6 in Attachment 1 of Enclosure B Engineering) in an area bounded by Vinci Avenue to the north; the former McClellan AFB boundary to the east; Raley Boulevard and the MCDC to the west; and Magpie Creek and Santa Ana Avenue to the south. Less structured than the above detention basins, the concept of flooding existing flood plains was retained and named as the natural flood detention basin measure. Results of analysis showed that the largest extent of inundation by the 250-year storm event is 76.5 acres, the use of which would be substantial in detaining floodwaters and, in combination with flood prevention measures, in reducing the area's flood risk.

Planning Objectives Met. In evaluating the 3 detention basins, the 200-year storm was found to exceed the smallest basin capacity of 147 acre-feet by about 40 acre-feet. Larger sizes of 186, 224, and 239 acre-feet were determined to have adequate capacities, however. While larger size basins met the criteria of increased flood protection of up to the true exceedence probability of 0.004, habitat losses were found to increase also. Impacts from the larger size basins were determined to disturb more seasonal wetlands than in the channel plan. Preliminary evaluation in the DPR showed that the 186 acre-foot detention basin would adversely impact 4.6 acres of habitat losses (1.5 acres of seasonal wetlands, 1.8 acres of emergent marsh, and 1.3 acres of riparian scrub-shrub habitat) and requires 17.4 acres in compensation. For the larger 224 and 239 acre-foot detention basins, an additional 1.6 acres of seasonal wetlands would be impacted and require 21 acres in compensation. With the high environmental impacts, these detention basins did not meet the environmental criteria.

The natural flood detention basin measure appeared to meet all planning objectives. Its use of the existing flood plain would cause little or no environmental adverse impacts. Further, it has potential to recharge existing vernal pools.

Status. Where the three detention basins failed to meet the environmental criteria, they were deleted from further consideration.

The natural flood detention basin measure was retained because of its low environmental impacts and potential for recharging existing vernal pools.

Table 3 summarizes the above evaluation.

Table 3. Summary of Flood Prevention Measures Reconsidered

Flood Prevention Measures/Plans	Planning Objectives Met?	Reasons	Status
Nonstructural			
Flood Proofing	No	Econ infeas and low flood protection	Deleted
Flood Plain Evacuation	No	Socially infeas and low flood protection	Deleted
Development Restrictions	Yes	Limited application only to the upper reach where development is sparse and flood risk minimal.	Deleted
Flood Warning	Partially	Has potential, but is part of a plan by others	Deleted
Structural			
Channel and Levee Plan	Partially	Plan was modified: channel component was deleted because of high env impacts. Levees retained for further study	Retained, levee only
Detention Basin Plan	Partially	Plan was modified from structured detention basins to use of natural flood plains in detaining floodwaters. This concept was so named as the natural flood detention basin measure.	Retained, the natural flood detention basin measure only

ALTERNATIVES IDENTIFIED

Two structural flood prevention measures were retained for development into alternatives plans.

At the early stage of the study, the non-Federal sponsor indicated its study objective to include a plan that would provide long-term flood protection. They considered flood protection to the 200-year and greater to be important to the area because it could result in FEMA certification and, thereby, deletion of flood insurance requirements.

To ensure the development and evaluation of a range of alternatives, plans were formulated to provide a range of alternative designs for true exceedence probabilities of 0.02, 0.01 and 0.004, which can be interpreted as floods occurring once in every 50, 100 and 250 years, respectively, even though the smaller size designs do not meet public safety.

Two alternatives were initially formulated from the two flood prevention measures carried forward. These alternatives are summarized in Table 4 and briefly described below. Details on the cost estimates are in Enclosure B Engineering.

Table 4. Summary of Alternatives Identified¹

Initial Alternative Identified	True Exceedence Probability	First Cost	Average Annual Costs	Expected Annual Benefits	Net Benefits
Levees/ Levee Raising Along Raley Boulevard	0.02	7,700	530	1,350	820
	0.01	8,300	570	1,630	1,060
	0.004	9,200	630	1,860	1,230
Natural Flood Detention Basin and Levee	0.02	8,300	570	1,350	780
	0.01	8,800	610	1,630	1,020
	0.004	9,310	670	1,860	1,190

¹ October 2002 price levels, in \$1,000's

Levee Raising Along Raley Boulevard Alternative

This alternative includes a new levee along the eastern edge of Raley Boulevard starting from Santa Ana Avenue and extending up to Vinci Avenue. A floodwall will be constructed along the western edge of the existing Raley Boulevard Bridge over Magpie Creek to connect the levees north and south of the bridge. The plan is to prevent all outflanking and overtopping and to keep flood flows in the MCDC. The new levee and floodwall along Raley Boulevard will be approximately 2,500 feet long and constructed to an elevation of 49.5 feet. A new culvert for Don Julio Creek will be placed where the levee crosses the existing creek. This alternative includes flooding of approximately 68 acres bounded to the west by Raley Boulevard, to the north by Vinci Avenue, to the east by McClellan Business Park boundary, and to the south by Santa Ana Avenue, of which 48 acres are within the existing flood plain. New maintenance roads between Vinci Avenue and Dry Creek Road, flood control gates, and removal of a tank are also included.

Total estimated first and annual costs for this plan including all lands, easements, rights-of way and relocations and disposal areas necessary for project construction, environmental mitigation, engineering and design, and supervision and administration for reduced flood risks at the 0.02, 0.01 and 0.004 true exceedence probabilities are \$7,700,000, \$8,300,000, and \$9,200,000 and

\$530,000, \$570,000, and \$630,000, respectively. Similarly, the expected annual benefits are estimated at \$1,350,000, \$1,630,000, and \$1,860,000 with net benefits of \$820,000, \$1,060,000, and \$1,230,000, respectively.

Natural Flood Detention Basin and Levee Alternative

This is similar to the locally revised plan, except that the plan was expanded to three designs of 0.02, 0.01 and 0.004 true exceedence probabilities. The plan includes levee raising on the existing levee along the MCDC; new levee along Raley Boulevard; flooding of about 76.5 acres of existing flood plain bounded to the west by the MCDC and Raley Boulevard, to the north by Vinci Avenue, to the east by the former McClellan AFB boundary, and to the south by Magpie Creek and Santa Ana Avenue; a culvert and flowage channel through bike trail embankment at Robla Creek; new maintenance roads along the MCDC and between Vinci Avenue to Dry Creek Road; flood control gates; and removal of a steel tank. Features of the plan include:

Levee Raising. The existing left bank levee of the MCDC is raised up to a maximum of 5 feet in height for a distance of 2,100 feet. The proposed raised levee begins just downstream from Raley Boulevard to just upstream of Vinci Avenue. The construction area is limited to the top of levee, landside slope and a maximum of 5 feet on the waterside slope measured from the top of the levee.

New Levee. A levee is constructed along the west side of Raley Boulevard south from the Magpie Creek Bridge for a distance of about 1,000 feet to prevent floodwaters from outflanking the existing levee of the MCDC. This levee is on the street side of the Kelly-Moore paint store and designed to allow continued public access to the paint store.

Flooding of Existing Flood plain. The area at 76.5 acres would be inundated by the 250-year event. The computed increase in water surface is approximately 0.7 feet at Raley Boulevard and 0.2 feet at the western boundary of McClellan Business Park. The inundated land would be acquired and preserved as flood plain areas. The flood plain for the 250-year event is shown on Figure 6 in Attachment 1 of Enclosure B.

Culvert and Drainage at Robla Creek. Three 5'X5' culverts providing an opening of 75 square feet would be installed through an embankment to Robla Creek. The top of the culvert is about 2 feet below the existing surface of the bike path and its invert is above the existing invert of Robla Creek. Low flows would be maintained in the current channel. The new culvert was sized to reduce changes in peak flood stage upstream of Dry Creek Road. Drainage is provided from the new culvert to Robla Creek. All work would be performed a minimum of 5 feet away from top of bank of the existing Robla Creek channel.

New Maintenance Access Road. An access road, approximately 12-foot wide, is constructed at the toe on the landside of levee from Raley Boulevard to Vinci Avenue and from Vinci Avenue to Dry Creek Road on the west bank of the MCDC. The road would provide access for maintenance vehicles.

Flood Control Gates. Because of Kelly-Moore Paint Store's proximity to Raley Boulevard, a 5-foot high floodgate would be installed across the driveway. An additional 4-foot high floodgate is required at the driveway of a new development just south of the Kelly-Moore Paint Store property. In addition, another 2-foot high floodgate is required at Santa Ana Avenue, but the local sponsor has requested that flood fighting be implemented at Santa Ana Avenue.

Removal of a Steel Tank. An abandoned aboveground storage tank located north of the MCDC and west of Raley Boulevard and debris would be removed and disposed.

Total estimated first and annual costs for this plan including all lands, easements, rights-of way and relocations and disposal areas necessary for project construction, environmental mitigation, engineering and design, and supervision and administration for the 0.02, 0.01 and 0.004 true exceedence probabilities are \$8,300,000, \$8,800,000, and \$9,300,000 and \$570,000, \$610,000 and \$670,000, respectively. Similarly, the expected annual benefits are estimated at \$1,350,000, \$1,630,000, and \$1,860,000 with net benefits of \$780,000, \$1,020,000 and \$1,190,000, respectively.

SCREENING OF ALTERNATIVES

Economic Considerations

Without-project flood plains at the true exceedence probabilities of 0.1, 0.02, 0.01, 0.004 and .002, which can be interpreted as floods occurring every 10, 50, 100, 250 and 500 years, were developed for the damage assessment. The 100- and 500-year flood plains are represented on page B-1-24 in Attachment 1 of Enclosure B. The flood plains were developed with the assumption that a breach would occur when the flow in the MCDC reaches the channel capacity of about 1,100 cfs just downstream of Raley Boulevard. At time of breaching, flows greater than 650 cfs would drain into historic Magpie Creek. Details on the flood plain development are described in the Hydraulic Design Attachment 1 of Enclosure B Engineering.

Flood plains were also developed for the with-project conditions at the 0.1, 0.02, 0.01 and 0.004 true exceedence probabilities.

An economic reanalysis was performed to calculate the benefits attributable to the various alternatives by computing expected annual flood damages under without-project and with-project conditions. Details on the

economic reanalysis are in Enclosure D Economic Analysis. The economic analysis was based on October 2002 price levels, a discount rate of 5-7/8 percent and 50-year period of analysis. Using Sacramento County Assessors data disks and Marshall & Swift Valuation Service multipliers generated depreciated replacement values of damageable structures. Because property values are often skewed by California's Proposition 13, the values taken from the above disks are adjusted using Marshall & Swift as well as square footage information for the affected structures. Total damageable property of inventoried units in the flood plain is valued at about \$51,800,000. Table 5 below shows the total damageable units and structural values.

Table 5. Total Damageable Units and Structural Values

Inventory	Units	Value (in \$ millions)
Residential	295	\$18
Commercial	9	\$8.2
Industrial	21	\$25.6
Total	325	\$51.8

The economic analysis used the risk based analysis procedures described in ER 1105-2-205, Risk-Based Analysis for Evaluation of Hydrology/Hydraulics and Economics in Flood Damage Reduction Studies, to evaluate the economic impacts to the flood plain and uncertainty in the economic conditions under without-project and with-project conditions for Magpie Creek. A stage-frequency curve was developed for without-project conditions west of Raley Boulevard at about Station 66+00 on the Magpie Creek Diversion Channel. The curve was taken at Station 66+00 since the critical reach of levee is along this section. Flood plains were developed at this reach of levee assuming levee failure due to headcutting on the landside by overtopping flows. The flood plain was divided by cross section and each cross section provided water surface elevations that were used to determine the depth of flooding.

Since there is one existing levee under without-project conditions, the Probable Failure Point (PFP) at elevation 47.0 and Probable Non-Failure Point (PNP) at 46.0 were determined based on a levee breach scenario at Station 66+00¹. This re-analysis assumes that, without the Corps support, no future flood damage reduction measures will be undertaken that are more effective than the current levee system. It was also assumed that, should the existing levee fails, it will be repaired to the same level of effectiveness provided by the current system.

¹ Station 66+00 is located about 600 feet downstream of Raley Boulevard, where the south bank levee crosses the historic Magpie Creek channel. Because this was identified as the point where the levee height and overtopping failure potential are the highest for the project, it becomes the index point where the true exceedence probability of overtopping is calculated for specific flood protection. For example, an exceedence probability of 0.005 can be interpreted as a flood occurring once every 200 years or referred to previously as 200-year level of protection.

The flood plain was inventoried through field survey, aerial photography and other data and values were established. Depreciation was included in the valuing method. Uncertainties in structure and content values were taken into account. The main type of flood damage considered was physical damage caused by inundation. Additional damages included auto damages and emergency and road detour costs.

Flood damages were determined using the structure replacement cost less depreciation, content value, depth of flooding and depth versus percent damage relationship. The relationships used in this reanalysis were based primarily on the Institute for Water Resources research curves, FEMA curves, and Tennessee Valley Authority curves. The relevancy on the use of these curves to structures in the flood plain was verified by comparing data gathered on other Corps studies in the vicinity of Magpie Creek.

The expected annual flood damages under without-project conditions, assuming risk and uncertainty, are about \$2,060,000.

Table 6 displays the computation results of expected damages and benefits for the without-project conditions and with-project conditions under levee heights of both plans for the 0.1, 0.02, 0.01, and 0.004 true exceedence probabilities, which can be interpreted as floods occurring every 10, 50, 100, and 250 years.

Table 4 shows estimated first and annual costs, expected annual benefits and net benefits for the two alternative plans. Each plan has a positive net economic benefits, i.e., benefits exceed costs.

Table 6. Total Expected Annual Damages and Benefits, HEC-FDA Analysis¹

Without-project Existing Top of Levee = Elevation 47'; PNP = 46 PFP = 47'

	0.1 True Exceedence Probability 48' Top of Levee; PNP = 47' PFP = 48'		0.02 True Exceedence Probability 48.5' Top of Levee; PNP = 47.5' PFP = 48.5'	
	Residuals	Benefits	Residuals	Benefits
Expected				
2.057	1.172	885 249 -	707	1.350 599 -

¹Oct 2002 price levels, 50-year period of analysis, 5-7/8% interest rate, in \$1,000's

Without-project Existing Top of Levee = Elevation 47'; PNP = 46 PFP = 47'

Expected	0.01 True Exceedence Probability 48.8' Top of Levee; PNP = 47.8' PFP = 48.8'		0.004 True Exceedence Probability 49.25' Top of Levee PNP = 48.25' PFP= 49.25'	
	Residuals	Benefits	Residuals	Benefits
2.057	430	1.626 787 –	198	1.859 939 –

¹Oct 2002 price levels, 50-year period of analysis, 5-7/8% interest rate, in \$1,000's

Two conclusions can be made about the two alternatives on the basis of economic considerations.

- Plans providing higher flood protection cost more, but they also provide greater net economic benefits.
- Plans are relatively equal in cost effectiveness for the same reduction in flood risk.

Environmental Considerations

Alternatives were formulated to minimize impacts to the environment by avoiding priority habitats such as seasonal wetlands, emergent marsh, and riparian scrub-shrub.

Seasonal wetlands occur intermittently throughout the study area with relatively undisturbed wetland area east of Raley Boulevard between Magpie and Don Julio Creeks. Larger hard pan seasonal wetlands occur north and south of MDCD and in the historic Magpie Creek flood plain. Wetlands are depended on a reliable source of water.

Freshwater emergent marsh is sparse in the study area, mostly found as fragments within historic Magpie, the MDCD, and Don Julio and Magpie Creeks. Similarly, riparian scrub-shrub exists in limited areas within the MDCD, on Don Julio and Magpie Creeks east of Raley Boulevard, and in historic Magpie Creek.

Considering the environmental sensitivity within the study area, a comparison of the environmental difference was made on the two alternatives to determine the alternative with the lesser impacts. The major difference between the two alternatives is the acquired preservation areas, which would provide considerable protection of wetland and riparian habitats. The use of flood storage in existing flood plain reduces the need for higher levee design.

Inherently, the Levees/Levee Raising Along Raley Boulevard Alternative would result in greater environmental impacts for the same reduction of flood risk. With greater impacts, the costs of mitigating would increase. The costs for mitigation of the two plans are estimated at \$1,500,000 for the Levees/Levee Raising Along Raley Boulevard Alternative and \$25,000 for the other alternative at 0.01 true exceedence probability. This would make the Natural Flood Detention Basin and Levee Alternative the preferred alternative with the lesser impact. The cost data are indicated in Enclosure B Engineering.

On the basis of economic, environmental and cost comparisons of the two plans, the Natural Flood Detention Basin and Levee Alternative was retained.

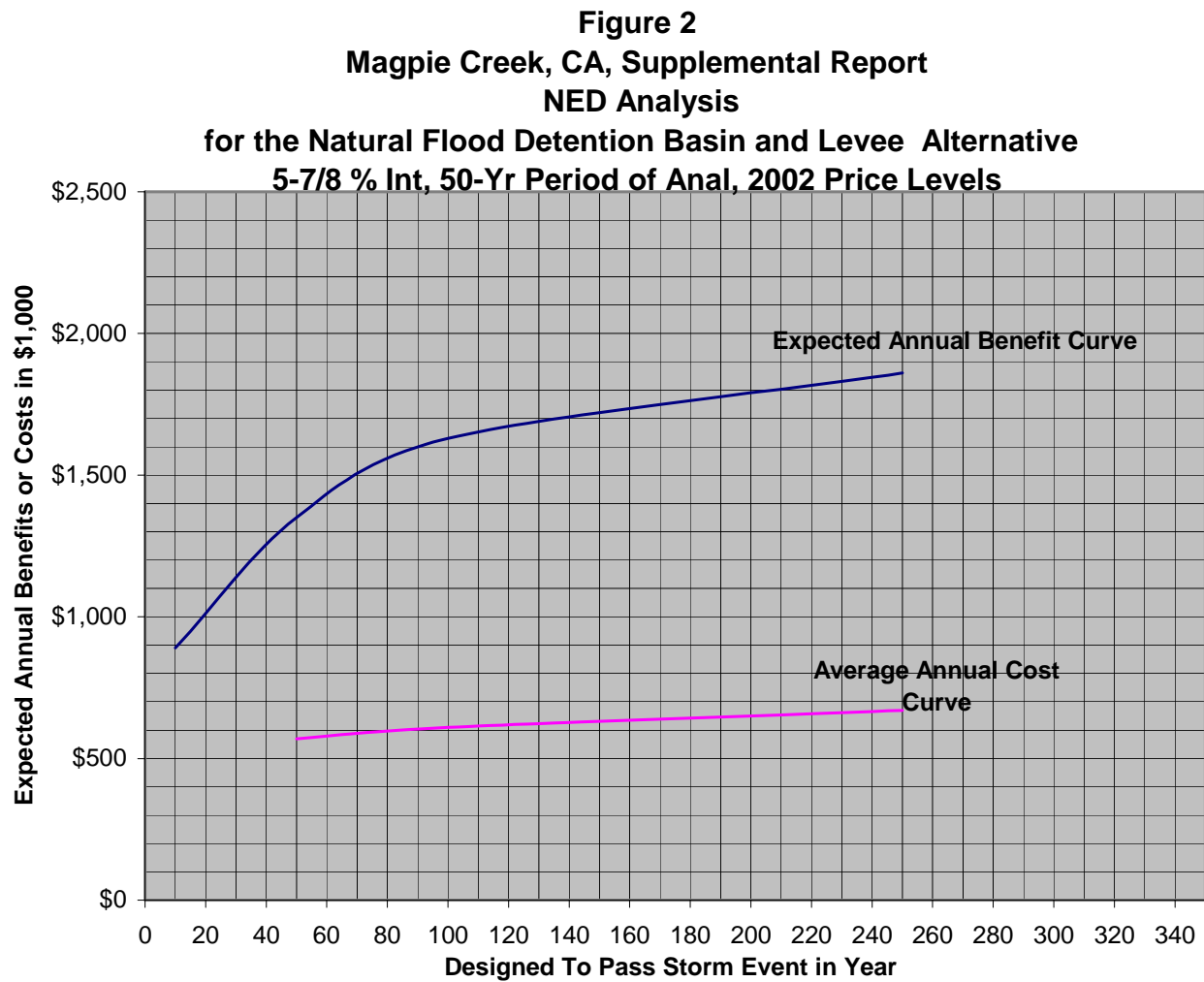
National Economic Development (NED) Plan Identification

NED analysis was performed on the Natural Flood Detention Basin and Levee Alternative. Table 7 summarizes the NED analysis from the benefit and cost data curves shown in Figure 2.

Table 7. Results of NED Analysis, Natural Flood Detention Basin and Levee Alternative¹

Alternative	True Exceedence Probability	Expected W/O Project Annual Damages	Expected W/ Project Residual Annual Damages	Expected Annual Benefits	Average Annual Cost	Net Economic Benefits	Benefit-to-Cost Ratio (BCR)
Natural Flood Detention Basin and Levee	0.10	2,060	1,170	890	-	-	-
	0.02	2,060	700	1,350	570	780	2.4
	0.01	2,060	430	1,630	610	1,020	2.7
	0.004	2,060	200	1,860	670	1,190	2.8

¹ 5-7/8% Interest rate, 50-year period of analysis, October 2002 price levels, \$1,000



The NED analysis indicated that the NED plan lies outside of the benefit and cost curves. The benefit curve is noted as still rising at a positive slope. While not the NED plan at the 0.004 true exceedence probability, this alternative was considered further because it meets the conditions for the Corps's categorical exemption to develop and recommend the NED plan. The conditions for this exemption are that (1) the non-Federal sponsor has identified a desired maximum level of protection, where the with-project residual risk is not unreasonably high and (2) where the plan desired by the sponsor has greater net benefits than smaller scale plans.

Since study initiation, the sponsor has strongly indicated that reducing flood risk, minimizing environmental impacts and lower costs are major objectives. This is demonstrated by the sponsor's letter of intent in Enclosure E and independent development of their locally revised plan. The sponsor has participation in all phases of this study, including developing new planning objectives that were used in this plan formulation.

The residual damages are low at about \$200,000 or about 10 percent of the total without-project damages of \$2,060,000.

The net benefits of smaller scale plans of the Natural Flood Detention Basin and Levee Alternative are not greater than the desired plan. The net benefits of \$1,020,000 and \$780,000 for the smaller scale plans at 0.02 and 0.01 true exceedence probabilities are less than \$1,190,000 of the desired plan at 0.004 true exceedence probability.

On the basis that the conditions for categorical exemption were met, the Natural Flood Detention Basin and Levee Alternative is to be considered as the NED plan and is to be cost shared in the same manner as the NED plan.

CHAPTER IV - PLAN SELECTION

The Natural Flood Detention Basin and Levee Alternative was the only alternative carried forward in the plan formulation process. In addition to this plan, the No Action Alternative below is required for comparison.

- No Action Alternative
- Natural Flood Detention Basin and Levee Alternative at 0.004 true Exceedence Probability

NO ACTION ALTERNATIVE

This alternative assumes no Federal participation in flood control to Magpie Creek. Any future developments would have to be flood proofed to the 100-year FEMA level. Without any flood control improvements, existing properties along the Magpie Creek corridor would continue to be at risk of flooding. Flooding at bridges over Magpie Creek, particularly Raley Boulevard, would continue to disrupt local transportation operations, and planned uses of land within the flood plain would be subject to development restrictions. It also assumes that development in the watershed continues as described in the City of Sacramento General Plan. This means that runoff will increase with time. The average annual equivalent flood damages are expected to reach about \$2.1 million in the study area.

PLAN SELECTION CRITERIA

As previously identified in the DPR, four planning constraints were used in formulating and evaluating alternatives. These four criteria are completeness, effectiveness, efficiency, and acceptability and were used in this plan formulation process. Within this framework, the important factors leading to recommendation of the selected plan could be summarized into four categories of economic efficiency, environmental impacts, public health and safety and acceptability. Factors in each of the four categories fall within one or more of the planning constraints of completeness, effectiveness, efficiency, and acceptability. Pertinent information leading to the recommendation of the selected plan is described in these categories to show the plan selected not only meets the Federal selection criteria but also non-Federal goals and objectives.

Economic Efficiency

Efficiency is the degree to which an alternative satisfies NED criteria, as measured by the net economic benefits of an alternative. Net economic benefits represent the difference between the expected annual benefits achieved by and average annual costs of an alternative. Net economic benefits for the Natural Flood Detention Basin and Levee Alternative are shown in Table 7. The net benefits are higher for higher flood protection because of the relatively low level

of protection provided by existing flood control infrastructure, the relatively high value of structures estimated at \$51.8 million in the 500-year flood plain of the study area, and the topography which provides an opportunity for additional flood storage. While the Natural Flood Detention Basin and Levee Alternative is smaller than the NED (the highest net benefit) plan, it was identified as the highest net benefit plan that the local sponsor can afford.

Environmental Impacts

The environmental impacts of the Natural Flood Detention Basin and Levee Alternative are evaluated in the Environmental Assessment in Enclosure A. This evaluation was focused on direct impacts, indirect impacts, and impacts relating to residual flooding and is summarized below.

Direct Impacts. There would be no direct impacts from the Natural Flood Detention Basin and Levee Alternative.

Indirect Impacts. Because construction would occur primarily along the top and landside slope of the existing levee and along Raley Boulevard, no riparian habitat would be affected. Potential seasonal wetlands in the flood plain and adjacent to historic Magpie Creek would be minimal. These impacts are identified to affect 0.25 acre of wetlands only.

Impacts Related to Residual Flooding. Residual flood damages are a measure of the risk of uncontrolled flooding associated with the alternatives and the severity of the impacts, should an uncontrolled flood occur. In the study area, these impacts include: (1) loss of vegetation and special status wildlife and (2) social and economic impairment as a result of dislocated occupants in the flood plain, inundation of transportation facilities, damage to automobiles and other means of transportation, and destruction of capital equipment.

The Natural Flood Detention Basin and Levee Alternative would reduce these impacts. Specifically, this means that flood damages of about \$2.1 million in the without-project conditions – the No Action Alternative - would be reduced to about \$200,000 at the 0.004 true exceedence probability. If this is indicative of the environmental impacts avoided, the impacts caused by the Natural Flood Detention Basin and Levee Alternative would be significantly less than those in the No-Action Alternative.

Public Health and Safety

The local sponsor has taken the position that public safety considerations are paramount. Areas within the flood plain are subject to high risk of uncontrolled flows with the potential for significant loss of property. Under these circumstances, the sponsor has concluded that the average level of protection afforded by the 100-year standard is inadequate and that any project providing a

design that passes the 200-year flow or greater would be a substantial net gain in public safety. The Natural Flood Detention Basin and Levee Alternative would achieve this net gain by substantially reducing the risk of flooding.

Acceptability

The Natural Flood Detention Basin and Levee Alternative is similar to the locally revised plan with added features and increased flood protection. The sponsor has accepted this alternative because of the relatively minor differences in cost - of about 4 percent or \$330,000 - and its greater gains in reducing the flood risk.

PLAN SELECTION

Plan selection was based on all of the above criteria. The Natural Flood Detention Basin and Levee Alternative was rated the highest overall based upon the four evaluation criteria of economic efficiency, environmental impacts, public health and safety and acceptability and is the selected plan.

CHAPTER V - SELECTED PLAN

PLAN DESCRIPTION

This chapter describes the components, accomplishments and environmental impacts of the selected plan. The plan is combination flood storage and levee plan which would encompass about 76.5 acres of existing flood plain and have a top of levee elevation of 49.25 feet at station 66+00 west of Raley Boulevard, resulting in a true exceedence of 0.004, which can be interpreted as a flood occurring every 250 years. Features of the plan are described as follows:

MCDC Levee Raise

The selected plan includes raising the existing left bank levee (looking downstream) of the MCDC for a distance of approximately 2,100 feet (See Plate 1). The levee raise would begin just downstream from Raley Boulevard and continue to about 100 feet south of Vinci Avenue Bridge. The average height of levee raise would range in height from 5 feet at Raley Boulevard (elevation 49.91 feet NGVD), and taper down to existing ground (elevation 48.75 feet NGVD) near Vinci Avenue. The levee raise crown will be 12 feet wide, and have a 3H:1V side-slope on the waterside, and a 2H:1V side-slope on the landside. A new 10-foot wide aggregate base maintenance road will be constructed on top of the raised levee section. In addition, a new 10-foot-wide maintenance road will be graded at the landside base of the new raised MCDC levee. Because of seepage issues under the MCDC levee in the upper 560 feet of this reach, a 12-foot wide gravel trench will be constructed at the toe of the raised MCDC levee (see Geotechnical Attachment in Enclosure B Engineering). This trench will be five feet deep and contain gravel wrapped in a geotextile, and covered with eight inches of fill and four inches of aggregate base to form the toe road.

Raley Boulevard Levee

To prevent flood waters from outflanking the new raised levee on the MCDC, a new levee would be constructed along the west side of Raley Boulevard south from the bridge down to Santa Ana Avenue for a distance of approximately 1000 feet. This new levee will be located between the paint store property and Raley Boulevard as shown in Figure V-1. Runoff from the landside of the new levee will be redirected to historic Magpie Creek to maintain the existing flow up to about a 25-year event. Because of the proximity of the Kelly-Moore Paint Store to Raley Boulevard, a 5-foot high floodgate will be installed across the driveway instead of a ramped berm and a 4-foot high floodgate at the driveway of a new development just south of the Kelly-Moore Paint Store property. Although a third floodgate was considered at Santa Ana Avenue, the local sponsor requested that it be eliminated. Sandbagging by local forces would be implemented. The City of Sacramento is planning to raise Raley Boulevard

and construct a new bridge over Magpie Creek within five years, so a floodgate and berm at that location are unnecessary. The City also approved plans by a private developer who will be developing and raising the property south of the Kelly Moore site up to elevation 49.2 feet NGVD, so the amount of fill necessary for the berm is reduced on this property.

Inundated Lands

The area inundated by a 250-year event without the project in place is estimated to be 76.5 acres. Construction of the proposed improvements would slightly increase the water surface elevation during all flood events greater than a 5-year frequency. During the 250-year event, the increase in water surface is projected to be 0.5 feet at Raley Boulevard and 0.1 feet at the western boundary of McClellan Business Park. Already a flood plain, this project proposes to purchase and preserve the area as flood plain in perpetuity. For details on real estate estimates, see Enclosure C Real Estate.

New Maintenance Road

A new maintenance road will be constructed between Vinci Avenue and Dry Creek Road adjacent to the left bank (looking downstream) of the MCDL for a distance of approximately 2,700 feet (see Plate 1). An additional 2.5 acres of land would be acquired for the maintenance road of 10-foot-width with 1-foot shoulders on each side providing a 12-foot road width. The road will have a 4-inch aggregate base surface.

Bike Trail Culverts

Installation of three 5'X5' culverts through bike trail embankment would provide sufficient opening of 75 square feet to Robla Creek as shown in Plate 1. The top of the culvert would be about 2 feet below the existing surface of the bike path. The invert of the new culvert would be above the existing invert of Robla Creek to keep existing low flows in the current channel. The center of the new culverts would be located about 40 feet north of Robla Creek and the bike trail embankment. The culverts are sized to reduce changes in peak flood stage downstream on Dry Creek Road as a result of increased peak flows in the MCDL.

The culvert could be cast-in-place or built of prefabricated units that would be conveyed to the site by truck. Because the culvert would be placed beneath a recreational bike path, the construction would be phased such that only one-half of the paved area of the bike path would be closed at any time. This would allow continued use of the bike path during construction. Approximately 300 cubic yards (CY) of soil would be removed from the excavation (i.e., about 150 cubic yards from each half). Soil tests would be conducted on the removed material and if suitable, the soil would be used to construct the levee along Raley

Boulevard. If determined to be unsuitable, the material would be disposed of at a suitable location. Following excavation to the proper depth, the bottom of the excavation would be compacted to provide a firm foundation. Following placement of the precast culvert units, the remainder of the excavation would be backfilled and compacted. After backfilling, the disturbed area of the bike path would be repaved.

The bike trail embankment would be opened with three 5'x 5' culverts. These culverts will need to be pre-cast in two sections along the centerline perpendicular to the openings. This is necessary to allow half of the bike trail to be opened at all times to bicycle/pedestrian traffic during the construction. The culvert walls are designed to be one-foot thick with reinforcement throughout. The box culvert invert will be higher than the existing invert of the existing MCDC/Robla Creek Channel. The side slopes of the box culverts will match the existing slopes of the bike trail levee (approximately 2H:1V).

A new channel would be excavated upstream and downstream from the culvert, connecting the culvert with Robla Creek. The new channel would be above the existing channel invert to allow low flows to continue through the existing bridge. About 350 cubic yards of material would be excavated and, if suitable, used to construct the levee along the MCDC and Raley Boulevard. Any excess material or unsuitable material would be disposed of. Stone protection would be placed in the bed and sides of the new channel to minimize erosion.

Tank Disposal

An abandoned tank located between the MCDC and Raley Boulevard as shown in Plate 1 will be removed and disposed of to ensure project operation and public safety. The tank could be loosened from its site by repeated flooding over time and freed to float on the surface on project lands. This could cause damage to flood control works, private and public structures, or harm project operators or the public.

At the present time, there is no evidence of any hazardous waste or cleanup associated with disposing of this tank. However, the abandoned tank has not been tested for HTRW-related materials. Ultimately, the decision to remove the tank as part of the project would be decided with the non-sponsor during the plans and specifications phase. Because of costs, field tests during the feasibility phase were limited to levees, the main structure in all alternatives. Tests on the tank and additional studies, including potential impacts on project costs, were planned for the later plans and specifications phase of the project. If tests identify hazardous substances regulated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the local sponsor will be responsible for the tank removal, any clean up, and response costs at 100 percent non-Federal costs. At this stage of the project and as a

placeholder, the tank is assumed removable under current Federal laws and is therefore part of the project.

Relocation Features

The existing slide gate outlet to historic Magpie Creek will be replaced. As described earlier, two pipe gates located at Raley Boulevard and Vinci Avenue will be removed and reinstalled. Fencing along the north side of the Kelly-Moore Paint Store property will be removed and reinstalled at the new flood control easement line.

Environmental Mitigation Features

Direct Impacts. There would be no direct impacts from the selected plan.

Indirect Impacts. Because construction would occur primarily along the top and landside slope of the existing levee and along Raley Boulevard, no riparian habitat would be affected. Potential seasonal wetlands in the flood plain and adjacent to historic Magpie Creek would be minimal. These impacts are 0.25 acre of wetlands.

PLAN ACCOMPLISHMENTS

The plan accomplishments include a reduction of the expected annual damages from about \$2.1 million to \$200,000 (residual damages) based on October 2002 price levels, 5-7/8 percent interest rate, and 50-years period of analysis.

The plan includes inundation reduction expected annual benefits of \$1,860,000 at the average annual costs of \$670,000.

CONSTRUCTION CONSIDERATIONS

Construction

Construction of the proposed project is expected to take one construction season from approximately May 1 to October 1. The levee material composition and compaction requirements are listed in Attachment 2 in Enclosure B Engineering. If suitable, a portion of the embankment material for the raised MCDC levee and new Raley Boulevard levee would be taken from the new culverts through bike trail embankment for a distance of approximately 1.5 miles. If unsuitable, the material will be disposed of near Ascot Avenue and Dry Creek Road approximately 0.5 miles from the new bike path culvert. The remaining embankment material will need to be borrowed from a spoil pile at the same location as the disposal site, approximately 1 mile from the raised MCDC levee

and new Raley Boulevard levee. Another potential source of material is the soil excavated from the toe trench along the raised MCDC.

Construction of the culvert should take about 45 calendar days, and will be done prior to construction of the raised MCDC levee and new Raley Boulevard levee. Likely construction equipment would include an excavator or backhoe to excavate the culvert and new channel, two to three 20-cubic-yard trucks to haul away soil and bring in riprap, and a small to medium-capacity crane to place precast culvert units. In addition, a flatbed truck to deliver culverts, an asphalt paver to repave the bike path, and a pickup truck would be used to complete the construction.

Construction of the earthen levee along Raley Boulevard would need approximately 3,500 cubic yards of material, requiring approximately 175 truckloads to transport the material. The construction of the levee should take no longer than 30 days. Construction of the raised MCDC levee will require approximately 7,400 cubic yards of material, or about 370 truckloads. However, if the 1,300 cubic yards of material excavated for the seepage trench are suitable for embankment, this would reduce the number of truckloads to 305. Construction of the raised levee should last approximately 45 calendar days. The replacement of the aggregate base roadway would require approximately 450 tons of material or about 25 truckloads and should last about 2 weeks.

Grading for the new maintenance road between Vinci Avenue and Dry Creek Road adjacent to the left top-of-bank should take no longer than 1 week and would require the use of a small grader. Placement of the aggregate base roadway would require approximately 310 tons of material, or approximately 18 truckloads and should last about 2 weeks. Grading of the new maintenance road at the base of the raised MCDC levee between Raley Boulevard and Vinci Avenue should also take no longer than 1 week.

Tank removal and disposal should be completed in one trip and take one day.

Staging Area

The staging area is located on a section of Vinci Avenue adjacent to the left bank (looking downstream) of the MCDC. The site is 250 feet long and 40 feet wide. Access may be obtained either from Vinci Avenue or the MCDC maintenance road. (See Plate 1)

Borrow Site

The borrow site for the project is located about 300 feet west of Dry Creek Road between Ascot Avenue and the MCDC as shown in Plate 1. Approximately 6,000 cubic yards of material are available in the borrow pile. Borrow material

may also be obtained from the trench constructed at the toe of the raised MCDC levee, in addition to the material excavated from the bike trail culvert construction and channel excavation.

Disposal Site

The disposal site for the project is located about 400 feet west of Dry Creek Road between Ascot Avenue and the MCDC, adjacent to the borrow site material. Spoil material shall be piled no higher than 10 feet high.

OPERATION AND MAINTENANCE CONSIDERATIONS

Following completion of the construction, maintenance of the project will be the responsibility of the non-Federal sponsor. The project features requiring operation include the floodgate at the driveway into the Kelly-Moore parking lot, and sandbagging at Santa Ana Avenue and south as necessary to prevent outflanking of flows at Raley Boulevard. Otherwise, maintenance will be limited to annual levee inspections and repairs to the roads, levees, and culvert. Patrolling the base of the levees will also be required during flood events to assess levee stability and perform emergency repairs. The annual operation and maintenance cost was estimated to be \$10,000 per year for the selected plan.

COST ESTIMATE, COST SHARE, AND ECONOMICS OF THE SELECTED PLAN

Tables 8 shows the Federal and non-Federal cost share of the first cost of the selected plan. The total project cost is \$9,300,000 of which is to be cost shared between the local sponsor and Federal government according to current cost share requirements. Of the local share, the single most costly item is LERRDs at \$7,020,000. Additionally, the sponsor is required to contribute \$470,000 in cash to meet the minimum 5 percent cash contribution. The Federal reimbursement, \$2,840,000, offsets the local costs of \$7,490,000 (\$7,020,000 + \$470,000) to 50 percent share of \$4,650,000.

The average annual costs of the selected plan are shown in Table 9. Operation, maintenance, repair, replacement and rehabilitation costs represent the average costs of maintaining the project over the 50-year life. Based on similar projects, this is estimated at \$10,000 annually for the selected plan.

Table 10 summarizes the economic data on the selected plan. The economic data were based on the current authorized interest rate of 5-7/8 percent and October 2002 price levees, 50-year period of analysis and 50 years of project life (2003-2053). With the annual costs of \$670,000 and annual benefits of \$1,860,000, the net benefits are \$1,190,000 and benefit-to-cost ratio of is 2.8 to 1.

Table 8. Federal and Non-Federal Cost Share of the Selected Plan¹

Cost Share	Total
Federal	4,650
Non-Federal	4,650
(LERRD)	(7,020)
(Cash)	(470)
(Reimbursement)	(-2,840)
Total	9,300

¹ October 2002 price levels, in \$1,000's

Table 9. Average Annual Costs of the Selected Plan (\$1,000)

Costs	
Total First Costs	9,300
Interest Rate	5-7/8%
Period of Analysis (Years)	50
Interest and Amortization	660
OMRR&R Costs	10
Total Annual Costs	670

Table 10. Summary of Economic Data of the Selected Plan (\$1,000)

Item	
Annual Costs	670
Annual Benefits	1,860
Net Benefits	1,190
BCR	2.8 to 1

RISK AND UNCERTAINTY

Varying sizes of the selected plan were developed using the computer software, HEC-FDA, which computes the probability that a plan will successfully pass a given flood. These sizes were on the south bank levee of the MCDC, which would be raised under project-conditions from Raley Boulevard to just south of Vinci Avenue. Details on this computation are in Attachment 1 of Enclosure B Engineering.

The south bank levee was sized such that it would successfully pass the 50-, 100-, and 250-year flood with 95% reliability. A reliability or conditional non-exceedence probability (cnp) of 90% for the 100-year flood is required for FEMA certification. If the computed 100-year water surface is less than 3 feet below the levee crest, then the requirement is a 95% cnp for the 100-year flood. The 95% criterion applies to the MCDC since the computed 100-year water surface is less than 3 feet below the levee crest.

The following are various input and assumptions that were used in computing the stage-frequency relationships and developing different sizes of the selected plan:

- The index point to determine the true exceedence probability of overtopping is the top of the MCDC levee located about 600 feet downstream of Raley Boulevard, where the south bank levee crosses the historic Magpie Creek channel and the levee height and overtopping failure potential are the greatest.
- Geotechnical studies show that the levees have a probable non-failure point (pnp) one foot below the levee crest, and a probable failure point (pfp) at the levee crest. The probability of levee failure is 15% and 85% at the pnp and pfp, respectively.
- The existing and project condition stage-frequency curves were developed by using computed water surface elevations at the above index point.
- An equivalent record length of 15 years was used in the analysis to describe the hydrologic uncertainty of a stream with uncalibrated data.
- Hydraulic uncertainty assumed both the worst and best case channel conditions. Under the worst-case channel condition, a 10% increase in the n-values, a one-foot increase in the channel invert to account for sediment deposition, and a four-foot increase in bridge pier widths to account for debris accumulation were included. Under the best-

case channel condition, a 10% decrease in the n-values, and no adjustment for sediment deposition or debris accumulation were assumed.

- The difference in water surface elevations between the worst and best-case scenarios at the index point is approximately 0.6 feet for the 100- and 200-year floods. The equivalent record length of 15 years was reduced to 12 years to account for the additional 0.6-foot stage variability that was estimated in the hydraulic uncertainty analysis.

Table 11 summarizes the results of this analysis. The conditional non-exceedence probability (cnp) of the south bank levee alternatives are displayed for several flood frequencies. It shows that levees with crest elevations of 49.2, 49.5, and 49.9 feet at the index point successfully pass the 50-, 100-, and 250-year floods with 95% cnp, respectively.

Table 11. MCDC Conditional Non-Exceedence Probabilities

Levee Crest Elevation (ft)	25-year	50-year	100-year	250-year	500-year
49.2	0.9802	0.9559	0.8853	0.7004	0.4935
49.5	0.9862	0.9844	0.9558	0.8438	0.6757
49.9	1.0000	0.9928	0.9905	0.9537	0.8648

PROJECT COST

The project cost is \$9,300,000. Table 12 Project Cost and Cost Share Summary of the Selected Plan provides a break down by the Corps's system of accounts. The average annual costs are \$670,000 of which the annual operation, maintenance, repair, replacement, and rehabilitation costs are \$10,000. Federal and the sponsor's non-Federal cost share are equally split at \$4,650,000. The sponsor is required to contribute \$470,000 in cash to meet the minimum 5 percent cash contribution. With Federal reimbursement of \$2,840,000, the local cost of \$7,490,000 (\$7,020,000 LERRDs + \$470,000 cash) is offset to 50 percent local cost share of \$4,650,000. These costs are based on October 2002 price levees and 15 percent contingencies, 5-7/8 per cent interest rate, 50-year period of analysis and 50 years of project life (2003-2053).

Table 12.**Project Cost and Cost Share Summary of the Selected Plan (\$1,000)¹**

Account	Non-Federal	Federal	Total
01 Lands	7,020	0	7,020
02 Relocations	0	0	0
06 Fish and Wildlife Facilities	0	30	30
08 Roads, Railroads & Bridges	0	80	80
11 Levees	0	360	360
30 Planning, Engineering & Design	0	1,610	1,610
31 Construction Management	0	200	200
Total Project Cost	7,020	2,280	9,300
Non-Federal and Federal Cost Share			
Federal			4,650
Non-Federal			4,650
(LERRD)			(7,020)
(Cash)			(470)
(Reimbursement)			(-2,840)
Total			9,300

¹ October 2002 price levels, in \$1,000's

CHAPTER VI - IMPLEMENTATION OF SELECTED PLAN

This chapter summarizes the procedures and Federal and non-Federal responsibilities to implement the project.

REPORT APPROVAL

The final report will be submitted to South Pacific Division of the Corps of Engineers for review and approval. Upon approval, the results of this report will be used to prepare plans and specifications. Initially, plans and specifications will be performed at Federal expense. After the Project Cooperation Agreement is signed, this cost will be added to the project construction cost and shared with the sponsor.

DIVISION OF PLAN RESPONSIBILITIES

Federal Responsibilities

- Prepare plans and specifications.
- Contract and supervise construction.
- Conduct periodic inspection of completed work with the sponsor to assure proper operation and maintenance.

Non-Federal Responsibilities

Along with other non-Federal responsibilities below, the cost share requirements for structures features are 35 – 50 percent.

- Provide without cost to the United States all lands, easements, and rights-of-way necessary for construction and maintenance of the flood control and associated mitigations, including all necessary relocations of buildings, utilities, roads, bridges (except railroad bridges), sewers, irrigation diversions, and related special features.
- Hold and Save the United States free from damages due to construction and subsequent maintenance of the project, except for damages which are caused by the fault or negligence of the United States or its contractors, and, if applicable, adjust all claims concerning water rights.
- Maintain, operate, repair, replace, and rehabilitate all completed works, without cost to the United States, in accordance with regulations prescribed by the Secretary of the Army. Monitor the status of completed mitigation and provide periodic reports on its condition, and provide repairs and replacement, if needed.

- Provide lands, easements, rights-of-way, relocations, and disposal areas and, if necessary, pay additional cash contribution to bring the non-Federal share to 35 percent of the total project cost of the project.
- Provide cash contribution of 5 percent of the total project cost of the project and an additional cash contribution, if necessary, to bring the non-Federal share to a minimum of 35 percent of the total project cost with credit given for lands, easements, rights-of-way, relocations, and disposal areas. The non-Federal contribution shall be made concurrently and proportionally with Federal expenditures during project construction.
- Comply with the provisions of the “Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970” (Public Law 91-646, 84 Stat. 1894), as amended.
- Comply with the provisions of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (Public Law 96-510, 42 USC 9601-9675). Specifically, the non-Federal sponsor must assume complete financial responsibility for the cleanup of any hazardous material located on project lands and regulated under the Comprehensive Environmental Response, compensation and Liability Act (CERCLA) and be responsible for operating, maintaining, repairing, replacing, and rehabilitating the project in a manner so that liability will not arise under CERCLA.
- Publicize flood plain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to ensure compatibility between future development and protection levels provided by the project.

PROJECT COOPERATION AGREEMENT

Prior to acquiring real properties for construction of the project, the non-Federal sponsor and Federal will execute the project cooperation agreement. This document will define the responsibilities of the non-Federal and Federal on cost share, project construction and operation.

CHAPTER VII - CONCLUSIONS AND RECOMMENDATION

CONCLUSIONS

The project was reevaluated on the basis of changed conditions. In light of the locally revised plan, a limited plan formulation was conducted to review previously studied flood prevention alternatives and to investigate new ones. Through this process, the Natural Flood Detention Basin and Levee Alternative with a true exceedence probability of overtopping of 0.004, which can be interpreted as a flood occurring every 250 years, was identified as the selected plan.

This study assumes that the Corps's categorical exemption is applicable and that development and recommendation of the NED plan is not required. While smaller than the NED plan, the selected plan is to be cost shared in the same manner as the NED plan and is to become a Federally supportable plan.

Based on plan formulation and analysis, the selected plan was rated the highest overall based on satisfying the planning objectives and constraints. The total first cost of the selected plan is \$9,300,000 (October 2002 price levels). The total annual costs of the plan, including operation and maintenance costs at \$10,000, are \$670,000. The expected annual benefits at 5-7/8-interest rate and 50-year period of analysis are \$1,860,000, yielding a benefit-to-cost ratio of 2.8 to 1.

The selected plan includes 2,100 feet of levee raising, 2,700 feet of new maintenance road, 1,000 feet of new levee along the west side of Raley Boulevard south from the bridge down to Santa Ana Avenue, two floodgates, acquisition of 79 acres (including 76.5 acres of flood plain and 2.5 acres for roads), culverts and flowage channel through bike trail embankment, and removal of an abandoned tank.

RECOMMENDATION

Based on the findings and conclusions in this report, I recommend that the selected plan be approved for preparation of plans and specifications.

Michael J. Conrad
Colonel, Corps of Engineers
District Engineer

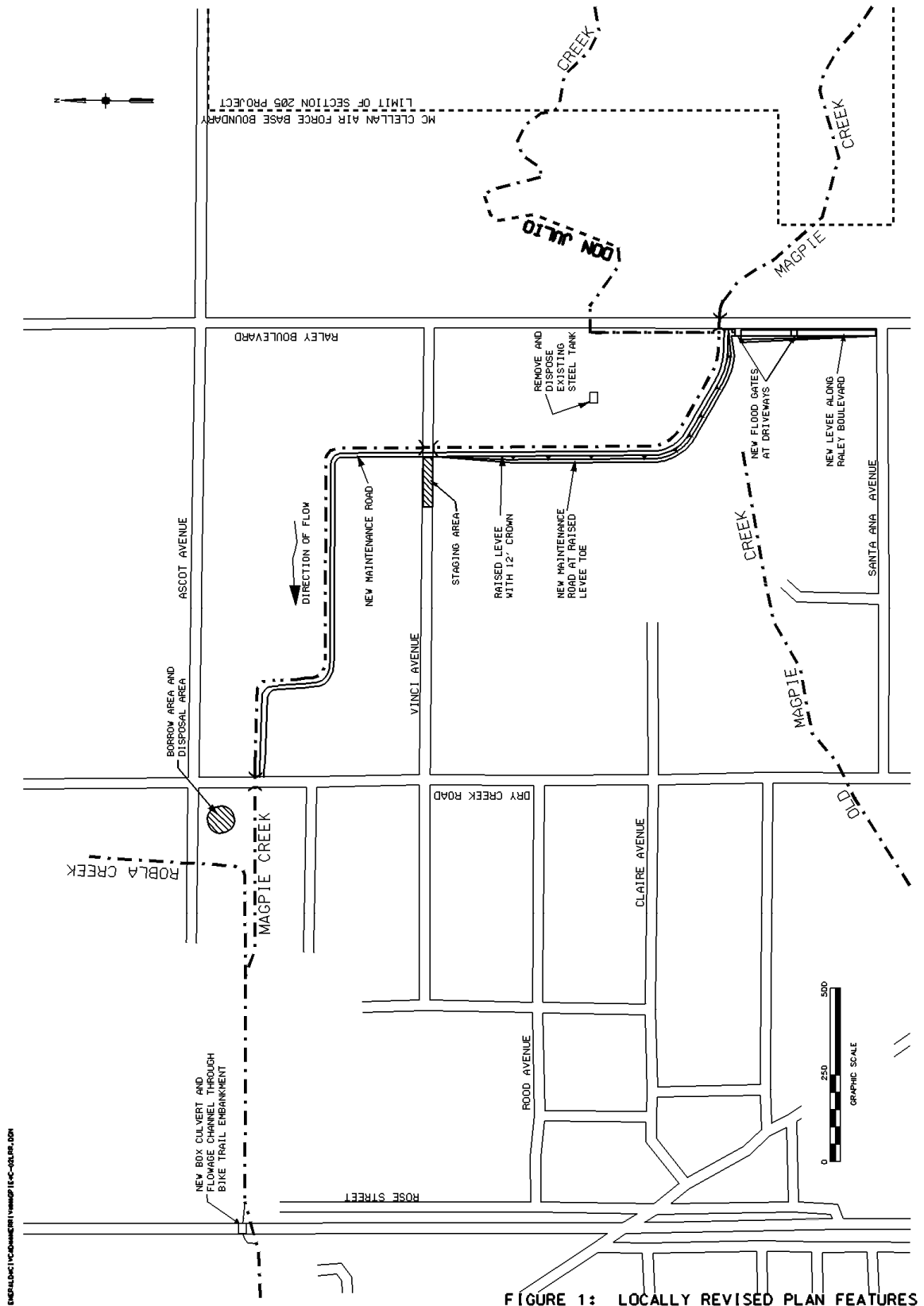


Plate 1
Magpie Creek, CA
Features of the Selected Plan